Structural priming in bilingual contexts: Testing the interplay between lexicon and syntax in unilingual and code-switched language use

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Using language: linguistic options
Using language: linguistic options

Message

Situation Model

Semantic representation

Syntactic representation

Lexical representation

Phonological representation

Phonetic representation

Phonetic representation
Using language: linguistic options

e.g., different mode of speech, dependent on discourse situation
Using language: linguistic options
Using language: linguistic options

- Situation
- Model
- Semantic representation
- Lexical representation
- Syntactic representation
- Phonological representation
- Phonetic representation

Message

E.g., reduced speech, accented speech
Using language: linguistic options
Using language: linguistic options

- Situation
- Model
- Semantic representation
- Lexical representation
- Syntactic representation
- Phonological representation
- Phonetic representation

Message

E.g., couch vs. sofa
Using language: linguistic options

Situation
Model
Semantic
representation
Lexical
representation
Syntactic
representation
Phonological
representation
Phonetic
representation
Message

‘boy gives girl ball’
vs.
‘boy gives ball to girl’
Options also in comprehension

The waitress prodding the clown with the umbrella.

E.g., Branigan et al., 2005
**Bilingual language use**

Even more linguistic options:

- Given the discourse situation, which language to use?
  - Language A, Language B, or both (code-switching)?

- Which words and syntactic structures to use from what language?

(e.g., Kootstra, van Hell, & Dijkstra, 2009, 2010; Kootstra, 2015)
**Bilingual language use**

Questions:

- **Interplay between processing levels?**
  - E.g., to what extent do lexical processes influence syntactic processes?

- **Interplay between languages?**
  - E.g., to what extent does Language A influence Language B?

- This can be studied via priming.

(e.g., Kootstra, van Hell, & Dijkstra, 2009, 2010; Kootstra, 2015)
Priming

- **Priming**: influence of preceding stimulus on processing current stimulus.

- **Structural priming**

  Just-heard sentence (prime): “The girl gives the guitar to the boy”

  Picture to describe (target):
Priming

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- **Structural priming**

  Just-heard sentence (prime): “The girl gives the boy the guitar”

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- **Cross-language structural priming**

  Just-heard sentence (prime): “The girl gives the guitar to the boy”

  Picture to describe (target):

  **IN A DIFFERENT LANGUAGE**

  e.g., Loebell & Bock, 2003; see Pickering & Ferreira, 2008, for a review
Priming

- **Priming**: influence of preceding stimulus on processing current stimulus.

- **Cross-language structural priming**

  Just-heard sentence (prime): “The girl gives the boy the guitar”

  Picture to describe (target):

  **IN A DIFFERENT LANGUAGE**
Also in comprehension

e.g., Branigan et al., 2005; Kidd et al., 2015

Figure 1. Example of a comprehension-to-comprehension trial (Experiment 1; high attached prime).
Cross-language structural priming

• Robust effect

Found across:
- Different languages
- Different tasks
- Different modalities
- From L1 to L2 and from L2 to L1

see e.g., Hartsuiker & Bernolet, 2017; Kootstra & Doedens, 2016, for more info
Cross-language structural priming

• Robust effect

Found across:
- Different languages
- Different tasks
- Different modalities
- From L1 to L2 and from L2 to L1

• Especially interesting: Priming in real life, short-term and long-term functions.

see e.g., Hartsuiker & Bernolet, 2017; Kootstra & Doedens, 2016, for more info
Why is structural priming interesting?

• **Typically**: structural priming as a methodological tool
  
  - Primable information $\rightarrow$ meaningful processing unit of language processing.
  
  - Primable across languages $\rightarrow$ evidence of cross-language activation.
  
  - Cross-language priming as a test of mechanisms and processing units in multilingual language processing models.
Explaining priming in terms of language production model

- ‘Preceding’ stimulus: Activation of representations belonging to this stimulus.
- E.g., listening to a sentence.

Diagram:

- Situation Model
- Semantic representation
- Syntactic representation
- Lexical representation
- Phonological representation
- Phonetic representation

Message flows from top to bottom, indicating the sequence of representation activation.
Explaining priming in terms of language production model

- ‘Preceding’ stimulus: Activation of representations belonging to this stimulus.
- E.g., listening to a sentence.
- Activated representation retain residual activation.

Diagram:
- Situation Model
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Residual activation leads to priming in target sentence production.
Explaining priming in terms of language production model

• ‘Preceding’ stimulus: Activation of representations belonging to this stimulus.

• E.g., listening to a sentence.

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Residual activation leads to priming in target sentence production. e.g., structural priming.
Explaining priming in terms of language production model

- ‘Preceding’ stimulus: Activation of representations belonging to this stimulus.
- E.g., listening to a sentence.
- Activated representation retain residual activation.

Residual activation leads to priming in target sentence production.

→ cross-language effect implies shared system for both languages.
Cross-language priming in real life?

• **Typically**: priming as a methodological tool

• **But**: Priming is also a real-life mechanism of language production

  - Dialogues: interlocutors use of same words, sentences, intonation etc.
  - Language production is generative / creative, BUT is situated in discourse.
  - Priming makes language production easy → building blocks for language production.

  (e.g., Enfield, 2008; Pickering & Garrod, 2004; Schober, 2006)
Cross-language priming in real life

• **Typically**: priming as a methodological tool

• **But**: Priming is also a real-life mechanism of language production

• **So**: priming as a mechanism of language production that is grounded in both cognitive and social processes.
Cross-language structural priming: not only ‘recent’ experience

➢ If priming takes place continuously in language use, including cross-language priming, then cross-language priming in bilinguals may lead to cross-language convergence / language change / language learning. (e.g., Loebell & Bock, 2003)
Functions of cross-language structural priming

**Short term:** modulates language processing in real time
- Makes language production easier
- Alignment in dialogue

➢ **Priming across languages**

**Long term:** language learning and change (emergent)
- Mechanism of implicit language learning
- Routinization in linguistic communities

➢ **Cross-language convergence / language learning**

Ferreira & Bock, 2006; Pickering & Ferreira, 2008; Pickering & Garrod, 2013
Bilingual language use: back to the questions

• Interplay between processing levels?
  ➢ E.g., to what extent do lexical processes influence syntactic processes?

• Interplay between languages?
  ➢ E.g., to what extent does Language A influence Language B?

• This can be studied via priming.

(e.g., Kootstra, van Hell, & Dijkstra, 2009, 2010; Kootstra, 2015)
This talk: two lines of evidence

1. Lexical effects in structural priming in bilingual children

2. Lexical triggering and priming of code-switching
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1. Lexical effects in structural priming in bilingual children

2. Lexical triggering and priming of code-switching
A meta-analysis of syntactic priming in language production

Kyle Mahowald a,⁎, Ariel James b, Richard Futrell a, Edward Gibson a

A B S T R A C T

We performed an exhaustive meta-analysis of 73 peer-reviewed journal articles on syntactic priming from the seminal Bock (1986) paper through 2013. Extracting the effect size for each experiment and condition, where the effect size is the log odds ratio of the frequency of the primed structure X to the frequency of the unprimed structure Y, we found a robust effect of syntactic priming with an average weighted odds ratio of 1.67 when there is no lexical overlap and 3.26 when there is. That is, a construction X which occurs 50% of the time in the absence of priming would occur 63% if primed without lexical repetition and 77% of the time if primed with lexical repetition. The syntactic priming effect is robust across several different construction types and languages, and we found strong effects of lexical overlap on the size of the priming effect as well as interactions between lexical repetition and temporal lag and between lexical repetition and whether the priming occurred within or across languages. We also analyzed the distribution of p-values across experiments in order to estimate the average statistical power of experiments in our sample and to assess publication bias. Analyzing a subset of experiments in which the primary result of interest is whether a particular structure showed a priming effect, we did not find evidence of major p-hacking and the studies appear to have acceptable statistical power: 82%. However, analyzing a subset of experiments that focus not just on whether syntactic priming exists but on how syntactic priming is moderated by other variables (such as repetition of words in prime and target, the location of the testing room, and the memory of the speaker), we found that such studies are, on average, underpowered with estimated average power of 53%. Using a subset of 45 papers from our sample for which we received raw data, we estimated subject and item variation and give recommendations for appropriate sample size for future syntactic priming studies.
Lexical and syntactic representations in closely related languages: Evidence from Cantonese–Mandarin bilinguals

Zhenguang G. Cai a,*, Martin J. Pickering a, Hao Yan b, Holly P. Branigan a

- Target language Mandarin

Fig. 4. Priming in Experiment 1. * Indicates a significant difference.

Target language Cantonese

Fig. 5. Priming in Experiment 2. * Indicates a significant difference.
Explaining priming in terms of language production model

- ‘Preceding’ stimulus: Activation of representations belonging to this stimulus.
- E.g., listening to a sentence.
Explaining priming in terms of language production model

- ‘Preceding’ stimulus: Activation of representations belonging to this stimulus.

- E.g., listening to a sentence.

- Activated representation retain residual activation.
Explaining priming in terms of language production model

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Residual activation leads to priming in target sentence production.
Explaining priming in terms of language production model

- **‘Preceding’ stimulus**: Activation of representations belonging to this stimulus.
  - E.g., listening to a sentence.
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Residual activation leads to priming in target sentence production. E.g., structural priming.
Explaining priming in terms of language production model

- ‘Preceding’ stimulus: Activation of representations belonging to this stimulus.
- E.g., listening to a sentence.
- Activated representation retain residual activation.

Residual activation leads to priming in target sentence production.

*boosted structural priming in case of lexical repetition*
Syntactic priming persists while the lexical boost decays: Evidence from written and spoken dialogue

Robert J. Hartsuiker a,*, Sarah Bernolet a, Sofie Schoonbaert a, Sara Speybroeck b, Dieter Vanderelst c

a Department of Experimental Psychology, Ghent University, Henri Dunantlaan 2, 9000 Ghent, Belgium
b Department of Marketing, University of Leuven, Naamsestraat 69, 3000 Leuven, Belgium
c Department of Industrial Design, University of Eindhoven, PO Box 513, 5600 MB Eindhoven, The Netherlands
Long-term priming effects (Hartsuiker et al.)

- E.g., structural priming

Preceding stimulus (prime): “The girl gives the guitar to the boy”

➔ Several filler items in between!!

Present stimulus (target):
Long-term priming effects (Hartsuiker et al.)

- E.g., structural priming

Preceding stimulus (prime): “The girl gives the boy the guitar”

→ Several filler items in between!!

Present stimulus (target):
Basic result

- Priming effect persists over time.

- But: lexical influence on priming does not seem to persist.
Are lexical effects different from syntactic effects then?
Are lexical effects different from syntactic effects then?

• Not necessarily:

Recent studies of structural priming have demonstrated that although there is evidence of verb-based effects in short-term priming (e.g., stronger priming when verbs are repeated between prime and target sentences), such effects are absent in long-term priming. We present evidence that verb-based effects can be observed in long-term priming situations. This result has important implications for theoretical accounts of the mechanisms that give rise to structural priming and other such adaptation effects in language production.
### Structure of Trials in the Bias and Prime Phases of the Experiment

**Bias Phase** (10 prime stems for each verb)

- DO Bias Verb (*send*)
- PO Bias Verb (*hand*)

Sample primes:
- *The teacher sent the student...* (DO)
- *The architect sent the client...* (DO)
- *The pianist sent the audience...* (DO)
- *The man handed the book...* (PO)
- *The captain handed his hat...* (PO)
- *The child handed the toy...* (PO)

**Priming Phase** (4 target stems for each verb)

- *Send*
- *Hand*

Target:
- *The mechanic sent...*
- *The professor handed...*

Target:
- *The spy sent...*
- *The politician handed...*

**Note**—DO, double object; PO, prepositional object.

- **Results:** significant effect of verb bias, based on repeated exposure.
Some key findings on structural priming in bilingual adults

• Found within and across languages → cross-language interaction in bilinguals.

• Both short-term and long-term / cumulative effects.

• Found in both production and comprehension (e.g., Kidd et al., 2015).

• Lexical overlap between prime and target enhances structural priming effect.

• Long-term effects do not seem to apply for the lexical boost effect, though see Coyle & Kaschak, 2008: patterns of experience with verbs across trials can influence priming effects).
What about bilingual children?

• Evidence of cross-language activation, yet also focus on language separation and autonomous development.

• Recently link with cross-language priming research.
  ➢ Focus on short-term priming in sentence production.

This leads to the following questions:
  ➢ Cross-language priming in comprehension?
  ➢ Within- and cross-language priming in comprehension similar?
  ➢ Persistence of the priming effects?
  ➢ Are long-term priming effects boosted by lexical overlap between prime and target, or are lexical overlap effects indeed only short-term?

e.g., Serratrice, 2013; De Houwer, 1990; Meisel, 2007; Hsin et al., 2013; Vasilyeva et al., 2010; Kidd et al., 2015
**Method**

**Participants:** 71 bilingual children, aged 7-10 (36 Dutch-English; 35 German-Dutch)

**Computer task:** Listen to ambiguous prepositional-phrase sentences while being presented with two pictures → click on the picture that matches the sentence.

- *Prime items:* only one picture is possible; it primes a specific interpretation
- *Target items:* both pictures are possible

### Session 1: Dutch primes and targets

1. Baseline phase
2. Priming phase (between participants)
3. Posttest phase

### Session 2: (two weeks later)

English/German primes, Dutch targets

1. Baseline phase
2. Priming phase (between part.)
3. Posttest phase
“De man raakt de inbreker met de vlag”
(The man touches the burglar with the flag)
Within-language session: priming phase (16 prime-target pairs)

**Prime condition group 1: Actor attached, No Lex Rep**

- **Target**
  - “De oma vangt de inbreker met de doos”
  - (The granny catches the burglar with the box)

- **Prime**
  - “De ridder achtervolgt het meisje met de vork”
  - (The knight chases the girl with the fork)
Within-language session: priming phase (16 prime-target pairs)

Prime condition group 1: Actor attached, Lex Rep

Target

Lexical repetition was manipulated between verbs. So specific verbs were always either actor-attached or patient-attached. Thus, pattern of experience with a verb is created.
Within-language session: priming phase (16 prime-target pairs)

Prime condition group 2: Patient attached, No Lex Rep

“De ridder achtervolgt het meisje met de vork”
(The knight chases the girl with the fork)

“De oma vangt de inbreker met de doos”
(The granny catches the burglar with the box)
Within-language session: priming phase (16 prime-target pairs)

Prime condition group 2: Patient attached, Lex Rep

Target

“De oma vangt de boer met de emmer”
(The granny catches the farmer with the bucket)

“De oma vangt inbreker met de doos”
(The granny catches the burglar with the box)

Lexical repetition was manipulated between verbs. So specific verbs were always either actor-attached or patient-attached. Thus, pattern of experience with a verb is created.
Within-language session: posttest (8 items)

“De heks raakt het meisje met de paraplu”
(The witch touches the girl with the umbrella)
**Results within-language priming**

- Significant short-term and long-term within-language priming effects
- Significant lexical overlap effects, but only in the ‘patient-attached’ condition.
Between-language priming

- Same idea, but now the prime sentences were in English resp. German.
- Target sentences were always in Dutch.
Results between-language priming

- Significant short-term and long-term between-language priming effects
- No effects of lexical overlap (because they are translation equivalents?)
### Effects of session 1 on session 2

<table>
<thead>
<tr>
<th>Group</th>
<th>Session 1</th>
<th>Session 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Actor-attached</td>
<td>Actor-attached</td>
</tr>
<tr>
<td>2</td>
<td>Actor-attached</td>
<td>Patient-attached</td>
</tr>
<tr>
<td>3</td>
<td>Patient-attached</td>
<td>Actor-attached</td>
</tr>
<tr>
<td>4</td>
<td>Patient-attached</td>
<td>Patient-attached</td>
</tr>
</tbody>
</table>
• Even after two weeks, the priming effect is still there.
Effects of session 1 on session 2 even within session

![Graph showing effects of session 1 on session 2. The graph compares actor attached and patient attached sessions in both session 1 and session 2. The x-axis represents different conditions, and the y-axis represents a scale from 0 to 1. The graph includes bars for 'PP_baseline', 'PP_Posttest', and 'PP_PrimingPhase'.]
Conclusions

First study to show in bilingual children:

- Within-language and cross-language structural priming in comprehension;
- Short-term and long-term effects.

➢ Consistent with model of adaptive processing and learning across language boundaries.

➢ Long-term lexical repetition effects show that these effects can also take place at lexical level, within language. Consistent with Coyle & Kaschak (2008)
This talk: two lines of evidence

1. Lexical effects in structural priming in bilingual children

2. Lexical triggering and priming of code-switching
This talk: two lines of evidence

1. Lexical effects in structural priming in bilingual children

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Code-switching

The use of multiple language within the same utterance.

For example:

- *English-Dutch*: En we reckoned Holland was too small voor ons.
- *English-German*: Für heaven’s Willen!
Why is code-switching interesting to study?

- **Interactive:** Overt reflection of cross-language activation in real life. Hallmark of bilingualism.

- **Dynamic:** Form and tendency of switching depends on discourse-situational, linguistic, speaker-specific and processing aspects.

- **Control:** Code-switching is not random, nor is it opportunistic.
  - In terms of grammar of code-switching
  - In terms of when bilinguals code-switch or not

- Code-switching warrants scrutiny in itself, but also provides an excellent test bed to investigate linguistic, psycholinguistic, and sociolinguistic hypotheses about language use and linguistic structure.

(e.g., Kootstra & Rossi, 2017)
Lexical triggering of code-switching

- Triggering hypothesis: Code-switching is more likely to occur in sentences containing a cognate or false friend.

Lexical triggering of code-switching

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• Statistical evidence from corpus: Broersma & de Bot [and colleagues] (2006; 2009).
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• Thus: lexical processes influence sentence-level processes (i.e., language choice in sentence production)
Lexical triggering of code-switching

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➢ Experimental evidence on this?
➢ Interaction with other sentence/discourse-level processes, such as priming?
Code-switching in dialogue: confederate-scripting technique

- Participants perform a dialogue game.
- Pictures may contain linguistic manipulation.
- **Confederate’s linguistic behavior is manipulated and serves as a prime for target picture description by real participant.**
  - Experimental control in relatively rich and natural discourse situation.
Code-switching in dialogue: confederate-scripting technique

- Participants perform a dialogue game.
- Pictures may contain linguistic manipulation.
- **Confederate’s linguistic behavior is manipulated and serves as a prime for target picture description by real participant.**
  - Experimental control in relatively rich and natural discourse situation.

e.g., Kootstra et al., 2009; 2010; 2020; Kootstra, 2015
Priming of code-switching in combination with cognate triggering

- **Priming of code-switching**:  
  “I switch when you switch”
  
or: “I use multiple languages when I have just heard/produced multiple languages”

- **Cognate triggering**: Code-switching is facilitated by words with a similar form across languages (e.g., Clyne, 1967, 1980; Broersma & de Bot, 2006).
  
e.g., The boy gives the **ball** to the fireman \(\rightarrow\) lexical similarity  
The boy gives the **bag** to the fireman \(\rightarrow\) no lexical similarity
Cognate condition

“The grandma picks the guitar from the table”

(The grandma picks the guitar from the table)

Dependent variable: Code-switch in picture description or not?
Non-cognate condition

“De jongen legt de wortel on the chair / op de stoel”

(The boy puts the carrot on the chair)

Participant is free to use whatever language in picture description.

Dependent variable: Code-switch in picture description or not?

Confederate

Participant

Kootstra, Dijkstra, & van Hell, 2020
TABLE 2 | Examples of critical trials in the Different Experimental Conditions of Experiment 1.

<table>
<thead>
<tr>
<th>Word category</th>
<th>CS by confederate</th>
<th>Confederate’s prime utterance</th>
<th>Participant’s target picture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>De jager legt de roos <strong>on the chair</strong>.</td>
<td>grandma putting baby on chair</td>
</tr>
<tr>
<td>Cognate</td>
<td>No</td>
<td>De jager legt de roos op de stoel.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[The hunter puts the rose on the chair]</td>
<td></td>
</tr>
<tr>
<td>False Friend</td>
<td>Yes</td>
<td>De duiker gooit de rok(^1) <strong>to the sailor</strong>.</td>
<td>waiter throwing game(^2) to sailor</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>De duiker gooit de rok(^1) naar de matroos.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[The diver throws the box to the sailor]</td>
<td></td>
</tr>
<tr>
<td>Control word</td>
<td>Yes</td>
<td>De slager neemt de jas <strong>from the wizard</strong>.</td>
<td>dentist taking bike from wizard</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>De slager neemt de jas van de tovenaar.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[The butcher takes the coat from the wizard]</td>
<td></td>
</tr>
</tbody>
</table>

The words in italics are the critical words (the patients) that are manipulated in terms of cross-language overlap. The underlined words refer to the part of the confederate’s utterance that is switched. \(^1\) The Dutch word “rok” is the equivalent of English “skirt” and is a false friend with the English word “rock.” \(^2\) The Dutch word for “game” is “spel,” which is a false friend with the English word “spell.”
Results

➢ Priming of code-switching, and cognate triggering.

FIGURE 1 | Percentages of code-switched responses per condition in the critical trials of Experiment 1. The error bars represent 95% confidence intervals.
A processing-based account of these effects
A processing-based account of these effects

e.g., Hartsuiker & Pickering, 2008; Kroll, Bobb, & Wodniecka, 2006; Kootstra, van Hell, & Dijkstra, 2009
A processing-based account of these effects

Lexical triggering: Cognates increase co-activation $\rightarrow$ CS
A processing-based account of these effects

Interlocutors prime each other, leading to int. alignment.

Also in bilingual dialogue, leading to int. alignment in CS

Pickering & Garrod, 2004; Kootstra, van Hell, & Dijkstra, 2010; Fricke & Kootstra, 2016
A processing-based account of these effects

2 Interlocutors
Interlocutors prime each other, leading to int. alignment.

Also in bilingual dialogue, leading to int. alignment in CS

Lexical and discourse processes interact in bilingual sentence production.

Pickering & Garrod, 2004; Kootstra, van Hell, & Dijkstra, 2010; Fricke & Kootstra, 2016
Priming in code-switching

- **Most basic form of primed code-switching**: tendency to code-switch is primed by previous code-switching / use of multiple languages.
  
  e.g., Fricke & Kootstra, 2016; Kootstra et al., 2020

- **But also**: syntactic priming in code-switched sentences and priming of sentence position where code-switching takes place.

  e.g., Kootstra, van Hell, & Dijkstra, 2010; 2012; Fricke & Kootstra, 2016
Bonus: corpus-based code-switching evidence

Or: move on to conclusions →
Priming in code-switching

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- Corpus evidence on this?
Priming in code-switching: Fricke & Kootstra (2016)
The Bangor Miami Corpus

- Deuchar, Davies, Herring, Parafita Couto, and Carter (2014)
- http://bangortalk.org.uk

Fricke & Kootstra (2016), *Journal of Memory and Language*
The Bangor Miami Corpus

• 56 conversations between 84 Spanish-English bilinguals from Miami, Florida

• ~ 250,000 words total, ~ 35 hours of speech

• Each conversation ~ 30 minutes in length. Researchers simply turned on the microphone and left the room.

• Most speakers knew each other quite well, and formed part of an extended social network.

• 17 F/F pairs; 7 M/M pairs; 17 F/M pairs; 15 F monologues

• age range 9 – 78 (mean = 32.7; median = 29.5)
The Bangor Miami Corpus

- The corpus is transcribed at the word level, and divided up into clauses (one main clause = one utterance).

- Each word is tagged as either English, Spanish, or ambiguous.

- Well she was telling me about this thing with Oprah.

- Y cuando yo le hablo a Miguel Angel se pone bien serio.

- Ellos dijeron que iban a dar appetizers at Wild Oats.
Creating the data set

- A Python script categorized each utterance as either unilingual or codeswitched. We tested the influence of previous utterances on current utterances.
Results: Primed CS in the Bangor Miami Corpus

- Separate analyses for ‘default-English’ and ‘default-Spanish’ conversations.
Results: Primed CS in the Bangor Miami Corpus

- **Short term priming**: if previous sentence was code-switched, current sentence was also more likely to be code-switched.

- **Long term priming**: if previous ten sentences contained ‘other-language’ words, current sentence was more likely to be code-switched.

- **Lexical boost / lexical coherence effects**: if previous sentence or even previous ten sentences contained ‘other-language’ words that were also present in the current sentence (in that language), this led to a higher tendency to code-switch.

- But priming effects remained significant when lexical coherence was controlled for.

  ➢ **So: short-term and long-term priming of code-switching ‘in the wild’, with important role for lexical processes.**
Conclusions
Bilingual language use

Questions:

• Interplay between processing levels?
  ➢ E.g., to what extent do lexical processes influence syntactic processes?

• Interplay between languages?
  ➢ E.g., to what extent does Language A influence Language B?

• This can be studied via priming.

(e.g., Kootstra, van Hell, & Dijkstra, 2009, 2010; Kootstra, 2015)
Conclusions

• Clear interplay between lexical and syntactic processes
  - Within and across languages
  - In production and comprehension
  - In children and adults
  - In both non-code-switched and code-switched sentences
  - With short-term and long-term effects

• This interplay can be studied using priming (in both experiments and corpora)

• Results are consistent with an interactive and adaptive view on language:
  - Interaction between lexical and grammatical levels of processing
  - Interaction between languages
  - Cumulative adaptation effects: language use / processing and language learning / convergence go hand in hand.
**Thank you for your attention!!**

<table>
<thead>
<tr>
<th>Collaborators in presented studies</th>
<th>Funding</th>
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<tbody>
<tr>
<td>• Sharon Unsworth</td>
<td>• NOW VIDI grant on the priming mind of bilingual children (awarded to Sharon Unsworth, Radboud University)</td>
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<tr>
<td>• Ton Dijkstra</td>
<td>• NSF-PIRE grant on bilingualism, mind, and brain (Penn State University)</td>
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<td>• Janet van Hell</td>
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<td>• Melinda Fricke</td>
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